Prospective Study of the Impact of a Natural Disaster on Parenting Behavior Trajectories Among At-Risk Aggressive Youth

By

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**Abstract**

Natural disasters create prolonged social and financial demands that may alter parents' abilities to be sensitive and responsive to their children. However, because natural disasters occur unexpectedly, limited research has examined how parenting behaviors change from before to after disaster exposure. The present study tested whether varying levels of exposure to a devastating tornado influenced parenting practices over an 18-month period pre- to post-disaster among at-risk children and their parents. Participants included 240 youth and their parents (ages 9-11; 65% male; 78% African American) who were participating in an ongoing, longitudinal preventive intervention for youth aggression prior to the tornado in April 2011. Dimensions of parenting assessed include parental involvement, low monitoring, and inconsistent and positive discipline. A natural experimental design was utilized to compare families who were exposed to the tornado to other families from the same community who completed the intervention and were assessed at all time-points prior to the disaster. Mixed effects linear models were estimated for parents by exposure group and by severity of exposure. Although patterns of change in parenting did not differ when comparing families in the exposed and non-exposed groups overall, significant differences in trajectories emerged when examining severity of tornado exposure within the exposed group. Compared to families who experienced at least one traumatic event during the tornado, families with community-level exposure reported significantly greater decreases in inconsistent discipline from pre-tornado to 12-month follow-up ($d$=.37). Further, direct exposure predicted trend-level increases in low parental monitoring across the full study period ($d$=.41). Results suggest that contextual elements of a disaster, such as personal loss and number of traumatic events experienced, are associated with inconsistency of parenting practices in the long-term aftermath of the disaster, as recovery-related demands persist. Implications for

the future study of disaster exposure, parenting, and youth's long-term self-regulation are discussed. *Keywords:* parenting, trauma, natural disaster, at-risk youth

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## Table of Contents


| | |
|---|---|
| Abstract | iii |
| Acknowledgements | v |
| Introduction | 1 |
| Method | 14 |
| Results | 24 |
| Study Aim 1 | 26 |
| Study Aim 2 | 30 |
| Discussion | 37 |
| References | 48 |
| Appendix I | 61 |
| Appendix II | 62 |

# Prospective study of the impact of a natural disaster on parenting behavior trajectories among at-risk aggressive youth

Extant disaster research demonstrates that children who experience natural disasters often exhibit posttraumatic stress (PTS) reactions (Masten & Osofsky, 2010; Norris et al., 2002). Large-scale traumas, such as natural disasters, affect both the individual child as well as the multiple systems in which the child develops (Bronfenbrenner, 1986; Masten & Obradović, 2008). There are many distinct etiological factors and pathways that contribute to youth posttraumatic growth and risk following disaster exposure (for review see Bonanno, Brewin, Kaniasty, & La Greca, 2010). For example, children's post-disaster adjustment may be influenced by pre-existing characteristics of the child (Felix et al., 2011; Weems et al., 2007) or contextual factors, such as social support and life stressors (La Greca et al., 2013a; La Greca & Silverman, 2012). In this study, we focus on one of these factors, parenting, for several reasons. First, parenting behaviors are a unique protective factor for youth adjustment; parenting quality, beliefs, and behaviors can strongly influence children's affect and behavior (Teti, Cole, Cabrera, Goodman, & McLoyd, 2017). Second, parenting behaviors may change in response to external family and environmental stressors. For instance, disasters create prolonged recovery-related demands that may increase family stress, alter parents' abilities to be sensitive and responsive to their children, and thereby lead to youth maladjustment. We therefore selected parenting as a potential mechanism because of its theoretical and empirical links to youth adjustment, both in the presence and absence of natural disaster trauma. Based on our understanding of contextual factors that influence children's functioning post-disasters, the goal of the current study was to examine how parenting practices and quality change from before to after a devastating tornado. The aim of this research is to better understand the specific elements of the parent-child

relationship that may, ultimately, contribute to youth's posttraumatic adjustment. The conceptual model that led to the study hypotheses is described below.

**The Tuscaloosa-Birmingham Alabama Tornado**

On April 27, 2011, Tuscaloosa and Birmingham, Alabama experienced a category EF4 (Enhanced Fujita Scale) tornado. The tornado had an 80-mile-long pathway and caused devastation to many neighborhoods: 12% of the buildings, including residential homes and public buildings, were damaged and/or destroyed, and communities reported 65 fatalities and 1,500 injuries. In terms of number of fatalities and the scope of damage, the Tuscaloosa-Birmingham Tornado is considered to be one of the most destructive and costliest natural disasters in the state of Alabama. Notably, the devastating tornado occurred during an ongoing preventive intervention for aggressive youth and their families after the completion of baseline data collection. As a result, the current study offers a unique perspective on trajectory of post-disaster functioning because it is one of a few studies to assess youth and their caregivers from pre to post a natural disaster.

**Parenting Behaviors and Youth's Adjustment**

Bronfenbrenner and Morris' (2006) bioecological model of human development describes the myriad factors that influence child development. The family is part of the microsystem (e.g., the child's immediate surroundings) and it is nested within several other systems that can both directly and indirectly influence parenting. These systems are: (1) proximal influences on parenting that occur within the family environment, including parental mental health and child behavior; (2) interactions between parent and child microsystems, such as the school and work; (3) distal influences on parenting, including economic and political contexts (called mesosystems); and (4) cultural values (the macrosystem).

Caregivers are a primary support resource for children and competent parenting is widely considered to be protective. In the first years of a child's life, competent parents protect their children from distress and scaffold developing social and emotional competencies. These parenting practices contribute to children's developing sense of security and attachment (Bowlby, 1969/1982). Continued caregiver sensitivity and responsiveness facilitate children's learning and self-regulation. Most notably, parents' communication with their children influences the ways in which children learn to respond to life events and self-regulate (Bögels & Brechman-Toussaint, 2006). Through these consistent parental behaviors, children learn that the caregiver is a reliable figure and source of comfort. Supportive caregivers are more likely to model appropriate expression of emotions and engage in conversations about emotional experiences. These behaviors facilitate children's positive adjustment. In fact, understanding, discussing, and responding empathically to children's emotional experiences is associated with fewer youth internalizing problems overall (Stocker, Richmond, Rhoades, & Kiang, 2007). Through open communication about emotions, parents may foster their children's emotional understanding and scaffold developing self-regulation skills.

Research on parenting often distinguishes between parenting practices and the emotional or psychological quality of parent-child interactions (Darling & Steinberg, 1993). Generally, parenting practices refer to the specific behaviors and strategies parents use to socialize and engage with their children, while quality refers to degree of warmth, hostility, or responsiveness (Teti & Candelaria, 2002). A recent review of the last six decades of parenting research (Teti, Cole, Cabrera, Goodman, & McLoyd, 2017) defined competent parenting as a blend of positive parenting practices and warm and consistent quality. The authors highlight the integration of nurturance and developmentally appropriate discipline and control. That is, high warmth and age

appropriate control encourages children's ability to self-regulate and promote positive psychosocial outcomes (Baumrind, Larzelere, & Owens, 2010; Maccoby & Martin, 1983). Although distinct parenting practices and indices of parenting quality may vary across cultures, parental warmth and control are two factors that have been consistently, and widely, shown to promote children's development (McLoyd & Smith, 2002; Teti & Huang, 2005).

**Cultural Influences on Parenting**

Recent literature has identified practices and qualities of competent parenting that are consistent across diverse cultural contexts. For instance, coercive parenting and abuse predicts psychosocial maladjustment, regardless of culture (Baumrind, 2012; Deater-Deckard & Dodge, 1997). Conversations about strong emotions have also been found to facilitate self-regulation among both African American and European American families (Bowie et al., 2013; Cunningham, Kliewer, & Garner, 2009)**.** However, the ways in which parents interact with and socialize their children have been shown to vary across cultures and socio-economic classes (Morelen & Thomassin, 2013). Cultural values and norms influence parental beliefs about emotions and children's behaviors, which can have implications for children's long-term social and emotional functioning. Generally, maternal attention to negative emotions has been linked to adaptive child outcomes among Caucasian families. However, one study found that African American mothers' attention to their children's negative emotions was negatively associated with problem solving skills for female children (Smith & Walden, 2001). Further, although punitive parenting has generally been linked to children's emotion dysregulation (Eisenberg et al., 1999), results from that study demonstrated that punitive parenting practices were positively associated with self-regulation. Another study highlighted African American mothers' belief that the display of negative emotions is maladaptive and may lead to negative social outcomes

(Nelson, Leerkes, O'Brien, Calkins, & Marcovitch, 2012). The authors hypothesized that this belief may preclude African American mothers from encouraging the processing and display of strong, negative emotions. Ultimately, parenting practices and qualities that are considered "adaptive" may vary depending on the cultural context. The current study contributes to a broader research effort to understand parent-child interactions in response to stressful situations among diverse populations, such as the predominantly African American, low socioeconomic status sample participating in this study.

**Parenting and Natural Disasters**

Extant research has demonstrated that parents influence how children cope with, and respond to, natural disaster trauma (Gil-Rivas, Kilmer, Hypes, & Roof, 2010; Hafstad, Gil-Rivas, Kilmer, & Raeder, 2010; P. Smith, Perrin, Yule, & Rabe-Hesketh, 2001; Spell et al., 2008; Vernberg, La Greca, Silverman, & Prinstein, 1996). Parents' own post-disaster distress may decrease a child's ability to appropriately adjust following a stressful natural disaster. For example, in the post-disaster recovery environment, parental unavailability, inconsistency of discipline, and marital conflict have been linked to youth's overall maladjustment (Gil-Rivas, Silver, Holman, McIntosh, & Poulin, 2007), aggression (Dishion & McMahon, 1998) and elevated post-traumatic stress symptoms (Kelley et al., 2010; Wasserstein & La Greca, 1998). In contrast, one study found that consistent and positive discipline were linked to children's positive post-disaster coping skills and also moderated the relation between trauma exposure and youth PTS (Scheeringa, Zeanah, Myers, & Putnam, 2004). That is, parental support buffered against the negative impact of the trauma event. Supportive caregivers may participate in conversations about the emotional experience, be sensitive to children's developmental stage and ability to cope with strong emotions, and encourage emotional expression (e.g., facilitate a dialogue about

strong emotions) (Vernberg, Hambrick, Cho, & Hendrickson, 2016). However, it is the consistency of these supportive parenting practices in the face of a trauma that may influence its predictive power on youth's adaptive psychosocial functioning. In other words, when parents provide supportive and encouragement that is similar to their pre-disaster parenting behaviors, this provides security, familiarity, and comfort for children during a potentially chaotic time (Vernberg et al., 2016). The consistency of caregiving behaviors may provide children with the support they need to better manage the aftermath of the trauma, thereby diminishing the possibility of poor psychological consequences.

The bioecological model of development identifies many proximal and distal factors that may influence parenting practices and quality (Bronfenbrenner & Morris, 2006). Some of these factors, particularly those that typically emerge in the post-disaster recovery environment, are described below. In particular, economic challenges, parents' mental health, interpersonal relationships, and child behavior interact and contribute to parenting practice and quality.

**The Influence of Distal Factors on Parenting**

**Economic resources.** Bronfenbrenner and Morris (2006) label the economy as one family microsystem. Lower income families often face social and emotional challenges that stem from a lack of substantial financial resources to adequately support and provide for the family. Families may have limited access to community resources, including libraries and community centers, and maintain irregular work schedules or work more than one job. Notably, fixed family income levels have been associated with positive developmental outcomes for children (Berger, Paxson, & Waldfogel, 2009). According to the Children's Defense Fund (2012), 21.6% of children under 18 years old in the United States live in poverty. When considering those families who live in "near-poverty", the total percentage of youth under 18 growing up poor increases to

about 40% (Yoshikawa, Aber, & Beardslee, 2012). These families contend, not only with the financial challenges of poverty, but also with the stress associated with raising children with insufficient resources. In turn, the stress associated with economic challenges may reduce parental warmth and consistency and increase parental use of coercive or inconsistent parenting practices (Conger, Conger, & Martin, 2010).

In the context of a natural disaster, a lack of economic resources can make it more difficult to recover. Low socioeconomic status has been found to be directly associated with higher levels of post-disaster distress (Norris et al., 2002). However, loss of financial resources after a disaster can also be a risk factor for high levels of post-disaster psychological problems (Bonanno, Brewin, Kaniasty, & La Greca, 2010). Loss of resources includes damage to personal property, homes, and loss of jobs. In fact, damage to property is associated with worry about the future and higher levels of distress (Elliott & Pais, 2006). According to the family stress model proposed by Conger and Donnelan (2007), financial hardships directly increase parents' stress and indirectly increase family conflict and poor parenting. Recently, this model has been applied to natural disaster contexts (Weems & Overstreet, 2008). That is, as parents put energy into coping with financial losses, such as reconstruction or finding a new place to live, their parenting behaviors inherently change. For example, extended stress may increase parental irritability and inconsistency. Likewise, several studies have linked economic hardships to less involved parenting (Conger et al., 2002; Sobolewski & Amato, 2005). Monitoring behaviors may decrease since parents must allocate time to disaster recovery activities (e.g., rebuilding communities, moving, finding resources). Post-disaster distress can also influence parents' abilities to be immediately responsive to their children's emotional reactions and needs (Gil-Rivas et al., 2007). One study, for example, demonstrated that parental unavailability post the 9/11 terrorist attack

was associated with high levels of youth PTS (Gil-Rivas et al., 2007). Thus, traumatic changes in environmental circumstances, and the resulting prolonged periods of stress, may ultimately weaken parents' abilities to be sensitive, responsive, and involved caregivers. Notably, the families included in the current study are from predominantly low socioeconomic status backgrounds. The cumulative stress from pre-disaster poverty and post-disaster financial hardships is expected to exacerbate parental stress, and, in turn, alter parenting practices.

**Parental mental health.** One of the largest influences on parenting is parents' own mental health (Teti et al., 2017). Parental psychological distress predicts children's behavioral and emotional development because it impairs their abilities to be effective caregivers. Parental depression, in particular, involves changes in emotional expression, cognitive functioning, and overall, can impair parent-child dynamics. Parent depressive symptoms have been linked to child behavioral problems and elevated anxiety (Goodman et al., 2011). Several researchers have attributed this association between parental depression and child psychological distress to changes in the broader familial environment (Eley et al., 2015).

When psychological distress emerges in the context of other distal or proximal stressors, it may be even more difficult to actively engage in positive parenting practices. After a shared traumatic event, the distressing environmental circumstances may exacerbate parental stress and increase parents' risk for developing anxiety and depressive symptoms. In turn, parents' own emotional state may change the ways in which they parent by increasing inconsistency of parenting techniques and altering how emotional available they are to their children. Previous literature highlights parental beliefs and cognitions as essential contributors to youth internalizing problems (Bögels & Brechman-Toussaint, 2006). Parents' own distress and psychopathology post-disaster may reduce the attention given to their children and parenting

strategies may become inconsistent because parents themselves are frustrated and dealing with their own emotional trauma. For example, one study noted that parents who are distressed about economic pressures, reported that they demonstrated less effective parenting behaviors and perceived themselves as incapable of consistent disciplinary actions (Mistry, Vandewater, Huston, & McLoyd, 2002). Therefore, parents' stress may cause parents to withdraw from relationships, thereby increasing family conflict and the use of poor parenting strategies (Conger et al., 1992).

**Social support depletion.** In the aftermath of a natural disaster, there is often an immediate outpouring of emotional and financial support from community members, aid and relief organizations, and other victims (Bonanno, Brewin, Kaniasty, & La Greca, 2010; Kaniasty, Norris, & Murrell, 1990). Parents who have extra support during this time may feel encouraged to engage with their children, validate their feelings, and be empathic to their emotional distress. In fact, studies have consistently demonstrated an association between perceived social support and better post-disaster adjustment among children and adults (Kaniasty & Norris, 1993). However, with time, this high level of support wanes, and survivors are often left to deal with the long-term outcomes of disasters alone (Bonanno, Brewin, Kaniasty, & Greca, 2010). Deterioration of support within the immediate social network is a common result of disaster-related deaths and relocation tasks; a disaster may cause friends and family to move away and survivors may subsequently feel isolated (Kaniasty & Norris, 2000; Norris, 1996). Parental distress levels tend to increase as individuals continue to deal with disaster-related hardships without interpersonal (community, familial) assistance. In turn, the biggest changes in parenting techniques are expected as parents begin to face economic and emotional hardships alone in the months following the disaster.

**Measuring Disaster Exposure and Response**

Overall, while prior research has consistently demonstrated a link between parenting behaviors and youth outcomes in response to natural disaster traumas (Rossman, Bingham, & Emde, 1997; Silverman & La Greca, 2002; Swenson et al., 1996; Wolchik, Wilcox, Tein, & Sandler, 2000), little research has explored, prospectively, how parenting behaviors change from pre- to post-disaster. Natural disasters often occur without warning and can cause pragmatic issues for research. In the immediate aftermath of a disaster, resources are allocated to survival and recovery needs and the environment is often not suitable for ethical research and informed consent (Masten & Osofsky, 2010). Ideally, research that evaluates the effects of disasters on functioning would contain pre-disaster assessments. However, the unpredictable nature of disasters typically precludes the feasibility of this kind of research. A few studies have utilized datasets from research projects that were already in progress prior to the disaster. For example, a previous study with the sample included in the present study, began several years prior to a devastating tornado. Follow-up data was collected 6 months, 12 months, and 24 months after the disaster (Lochman et al., 2017). However, because natural disasters are unexpected, most of the existing disaster literature examines the features of the post-disaster environment without systematic assessments of the environment before the disaster occurred.

The current study is drawn from a longitudinal project examining the effect of a natural disaster on youth who were participating in an ongoing preventive school-based intervention for aggression (Lochman et al., 2017). Because baseline data pre-tornado was available, this project provides one of the first opportunities to truly evaluate changes in functioning as a direct result of a natural disaster and to explore the positive impacts of school-based interventions in disaster-devastated communities. Understanding the factors that predict long-term problems among an

already vulnerable group of youth is important to identifying those who are most at-risk for future mental health problems.

**Research Design**

Previous disaster research has generally employed a quasi-experimental approach to examine the relationships among variables (North & Norris, 2006). The current study offers a unique opportunity to examine the effects of a natural disaster using a natural experimental design. A natural experiment is a design in which experimental and control groups are established based on natural events or circumstances (see Costello, Compton, Keeler, & Angold (2003) for an example). In the current study, midway through an ongoing project examining a preventive intervention for youth aggression, a tornado struck the communities involved in the intervention program. We use this natural event, in combination with the ongoing longitudinal intervention study, as the framework for the current study design. One group completed all study assessments at several time-points before the tornado occurred, whereas for another group, the tornado occurred in the middle of data collection. We can therefore examine the influence of natural disaster trauma on parenting behaviors over time. Although we did not experimentally manipulate the independent variable 'exposure to tornado', one significant advantage of this natural design is that we are not limited to post-hoc statistical control.

It is also important to consider that all observed patterns of parenting behaviors occurred within the context of an ongoing intervention for youth aggression. Overall, the bidirectional link between parenting and youth mental health has been widely documented, with parents influencing, and being influenced by, their children's behavior and capacity for self-regulation (Pettit & Arsiwalla, 2008). As youth in the current study attend the intervention and demonstrate decreases in aggression, we expect that, over the course of the study, parents will learn to

respond to their children with warmth, rather than frustration or harsh discipline. In other words, parenting practices may change in response to adjustments in children's behaviors, rather than because of the tornado alone. Further, emerging literature suggests that participation in school-based interventions, in which children learn cognitive reappraisal and self-regulation skills, may be protective against psychological distress following trauma exposure (Masten & Narayan, 2012). We control for the potential confound of intervention effects by comparing two similar groups of youth and their families who had both participated in the intervention.

**Summary**

Ultimately, it is important to understand pre- to post-disaster variations in parenting behaviors because family processes influence how children respond to, and cope with, trauma. However, because natural disasters are unpredictable in nature, baseline pre-disaster data is typically unavailable, and most research has only examined behavioral and emotional outcomes in the disaster recovery environment. Prior research has noted that the quality of parental discipline, and parents' ability to monitor and be involved with their children, decreases after exposure to traumatic natural disasters and as parents manage disaster-related recovery tasks (Felix, You, Vernberg, & Canino, 2013). The degree to which these parenting behaviors change may be a risk factor for youth maladjustment post-disaster.

The goal of the proposed study is to examine the trajectories of parenting behaviors from before to after a devastating tornado. Although greater disaster exposure is generally associated with worse adjustment in youth, even at high levels of exposure, a significant number of youth demonstrate resilience. This suggests that characteristics of the individual and qualities of the social environment moderate how disaster exposure affects developmental processes, such as children's emerging capacity for emotional or behavioral regulation (Masten & Osofsky, 2010).

Exploring how and why parenting practices change in response to natural disasters is essential as it may help to differentiate youth who are resilient post-disaster from those who are at risk for adjustment difficulties. The current longitudinal study uniquely assesses trajectories of parenting behaviors in response to exposure to a devastating disaster. Results may fill a gap in the literature by addressing this pathway in an at-risk (elevated aggression), largely African American, and low-income sample that is often underrepresented in disaster research.

**Aims of the Current Study**

**Aim 1: Comparing parenting for tornado exposed and non-exposed families.** The first aim is to utilize a natural experimental design to examine how a category EF4 tornado influenced four distinct parenting behaviors – involvement, low monitoring, inconsistent discipline, and positive discipline – over an 18-month period. These specific parenting behaviors were selected as they are part of the more general constructs of parental control and warmth. Parenting behaviors were assessed among families who experienced the tornado and then contrasted to families from the same communities who had all measurements before the tornado. It was expected that patterns in parenting behaviors would vary significantly among the exposed and non-exposed families. Specific hypotheses were that (1) parental involvement and positive discipline would decrease at a higher rate among tornado-exposed families as compared to non-exposed families; and (2) parental inconsistent discipline and low monitoring would increase at a higher rate among tornado-exposed families as compared to non-exposed families.

**Aim 2: Examining effects of degree of exposure on parenting.** The second aim of the current study was to examine how degree of tornado exposure influenced patterns in parenting behaviors over time. Given that severity of disaster exposure is linearly associated with degree of psychological problems in the post-disaster recovery environment (Norris et al., 2002), and since

only an estimated 30% of youth will demonstrate elevated symptomology immediately post-disaster (Bonanno, Brewin, Kaniasty, & La Greca, 2010), we examined the association between severity of disaster-related exposure and long-term changes in parenting behaviors. For this aim, it was hypothesized that all four parenting behaviors would be more likely to change within the year following tornado exposure among families with direct disaster exposure as compared to those families with less direct exposure. Specifically, among those parents and children with direct disaster exposure, involvement and positive discipline would decrease, and inconsistency of discipline and low monitoring would increase, six to twelve months post the disaster, as recovery-related demands persist.

## Method

### Participants

Data for the current study were collected as part of an ongoing, longitudinal study examining the effectiveness of a preventive intervention for youth aggression (Lochman et al., 2015). The original study recruited six students each year from 20 elementary schools in the southern United States during the 2008-2009 (Cohort 1), 2009-2010 (Cohort 2), and 2010-2011 (Cohort 3) academic school years. The current study's final sample was composed of 240 parent-child dyads from Cohorts 1 and 3. Only these cohorts were included in the sample in order to best utilize the natural experimental design and compare youth across the same developmental period (fourth to fifth grade) with and without tornado exposure[1]. **Table 1** presents the demographic characteristics for the study sample by tornado exposure group. Two hundred and

[1] Cohort 1 completed assessments at all time points *before* the tornado occurred, whereas for Cohort 3, the tornado occurred in the middle of data collection. Cohort 2 was a year older than Cohort 3 when the tornado occurred, and thus this group is excluded from the main analyses since it does not provide an equivalent comparison group in terms of age.

forty elementary school children between the ages of 9 and 11 ($M_{age}$ = 10.25, SD = 0.50; 66% male), along with one parent per youth, participated in the study. Among participating parents, 64.2% identified as single-family households (including parents who were single, divorced, widowed, or separated). Families' average annual income (which was measured in $15,000-$20,000 brackets) was between $15,000 and $29,999, ranging from No Income to above $100,000.

Table 1

*Demographic Characteristics of Full Baseline Sample*

| Variable | Exposed cohort (n=120) | Non-exposed cohort (n=120) |
|---|---|---|
| Youth Age (M, SD) | 10.21 (0.50) | 10.03 (1.42) |
| Youth Gender (% male) | 67.5% | 65.0% |
| Youth Race/Ethnicity | | |
| African American | 76.7% | 78.3% |
| Caucasian | 20.0% | 16.7%% |
| Hispanic | 0.0% | 2.5% |
| Other/Biracial | 0.8% | 2.5% |
| Annual Family Income | | |
| No Income | 3.3% | 5.0% |
| <$15,000 | 25.0% | 21.7% |
| $15,000 - $29,999 | 39.2% | 30.8% |
| $30,000 - $49,999 | 19.2% | 24.2% |
| >$50,000 | 13.3% | 18.3% |
| Parent Marital Status | | |
| Married | 35.8% | 35.8% |
| Single Parent Household | 64.2% | 64.2% |
| Relationship to Child | | |
| Biological Parent | 85.8% | 87.5% |

| | | |
|---|---|---|
| Other Relative | 14.2% | 12.5% |

**Recruitment**

Recruitment utilized a two-gate screening procedure. First, all fourth grade students in each of the participating elementary schools were screened using a brief teacher-report measure of aggression (Proactive-Reactive Aggression Questionnaire; Dodge, Lochman, Harnish, Bates, & Pettit, 1997). Students whose scores indicated psychosocial risk (at or above a cutoff score corresponding to the 75th percentile) were added to a list of eligible subjects (Gate 1). Parents of invited children then completed a parent-report measure of aggression (Behavior Assessment System for Children-Aggression scale; Reynolds and Kamphaus (1992)). Children who received scores at or above the risk cutoff were then eligible for enrollment in the intervention program (Gate 2). Families were randomly contacted until six children from each school were enrolled (e.g., if a family declined to participate, another family from the eligible list was randomly selected and invited to participate). Schools were then randomized to a group intervention or individual intervention condition. In order to conduct cluster randomization, schools were paired based on size, ethnic distribution, and eligibility for free/reduced meals and one school from each pair was randomly assigned to each condition.

All children received the Coping Power intervention (Lochman, Wells, & Lenhart, 2008) from the second semester of fourth grade through the end of fifth grade. Cohort 1 finished the full intervention a year prior to the tornado, Cohort 2 finished the intervention immediately before the tornado, and Cohort 3 finished the intervention during the year after the tornado. Primary Coping Power outcomes did not vary by intervention timing relative to the tornado (Lochman et al., 2017). While the intervention is not directly evaluated in the current study, all

students in the sample did receive the intervention. Because the groups are equivalent in terms of demographics and age at which they received the intervention, we can conclude that any differences that emerge are due to tornado exposure, rather than personal characteristics or intervention effects (see Lochman et al. (2015) for a full description of the intervention procedures, including topics covered and average number of sessions).

**Procedure**

For all Cohorts, pre-intervention (Time 1) measures were completed with children and parents during the Fall and early Winter of the students' fourth grade year. The Coping Power intervention was administered during the Spring semester of the fourth grade and throughout the fifth grade year. Mid-intervention (Time 2) assessments were completed the summer before fifth grade, and post-intervention (Time 3) assessed were completed the summer after fifth grade. The tornado occurred on April 27, 2011, in the middle of the ongoing intervention study. Appendix I presents a timeline of data collection procedures.

For Cohort 3, 120 caregiver-child dyads completed all measures 4-6 months pre-tornado (Time 1), within the first 6 months post-tornado (Time 2), and 12-14 months post-tornado (Time 3). A comparison group, Cohort 1, of 120 caregiver-child dyads completed the same parenting questionnaire at the same assessment intervals, but all data were collected before the tornado occurred. Thus, we are able to compare trends in parenting behaviors of exposed and non-exposed families across the same developmental period (fourth to fifth grade) and from the same communities.

At each time point of data collection, parents and children were interviewed separately by a trained researcher and completed self-report questionnaires individually. Data collection typically occurred at participants' homes. In accordance with a methodological approach

recommended by Kessler and colleagues (2008), at each data collection point, participants were asked to rate behaviors and functioning continuously (i.e., over the course of the past few months), rather than at the specific data collection time-point. This method was used so that we were able to reasonably ascertain participants functioning during the between data collection periods.

**Measures**

**Parenting behaviors.** Parental behaviors were assessed at all three time points through the parent-report Alabama Parenting Questionnaire (APQ; Frick, 1991) from before the tornado in April 2011 to 12 months post-tornado. The APQ has 42 items clustered into 5 subscales. Items are rated by typical frequency on a 5-point Likert scale (1 = *never* to 5 = *always*) and summed into continuous total scores. The measure has five subscales: involvement (e.g., "you do fun things with your child"); positive discipline (e.g., "you let your child know when he/she is doing a good job with something"); low monitoring (e.g., "your child is at home without supervision); inconsistent discipline (e.g., "you let your child out of a punishment early"); and corporal punishment (e.g., "you slap your child when he/she has done something wrong"). For the involvement, positive discipline, inconsistent discipline, and corporal punishment subscales, higher scores indicate more domain endorsement. For the low monitoring subscale, higher scores indicate less monitoring. Past research has found the APQ to have adequate internal consistency (Cronbach's α ranges from .60 to .80; Essau, Sasagawa, & Frick, 2006; Lochman et al., 2009) and good construct validity (Shelton et al., 1996).

Some studies have documented only moderate internal consistency for both the low monitoring and corporal punishment subscales (α = .59 and α = .55, respectively) (Dadds, Maujean, & Fraser, 2003). Low to moderate reliability could be due to parent reluctance to

endorse the more negative parenting domains, although previous studies have found that APQ scores do not correlate with measures of social desirability and parents are not failing to endorse certain items because of social norms (Shelton, Frick, & Wootton, 1996). In addition, parents may endorse some aspects of monitoring, but not others, further contributing to low reliability. In this study, alphas at baseline and each follow-up point were .67, .63, and .62 for the Inconsistent Discipline subscale, .75, .73, and .80 for the Involvement subscale, .79, .71, and .73 for the Positive Discipline subscale, and .64, .53, and .66 for the Low Monitoring subscale.

**Tornado exposure.** Tornado exposure and distress was assessed through the parent-report version of the Tornado-Related Traumatic Experiences (TORTE; Vernberg & Jacobs, 2005) collected within the first year following the tornado. The tool was adapted from a measure used to assess youths' hurricane-related traumatic experiences (Vernberg et al., 1996). The measure evaluates tornado-related experiences during the tornado (proximal exposure) and subjective loss, disruption, and distress in the first few weeks following the tornado (distal exposure). Proximal exposure is measured through six categorical yes/no exposure items of traumatic events during the tornado (e.g., windows or doors broke, saw someone get hurt badly) and one yes/no item of perceived life threat ("At any time, did you think you might die during the tornado?). Distal exposure is evaluated through 10 categorical yes/no items assessing traumatic events, loss, and disruption after the tornado (e.g., "home badly damaged or destroyed") and one item measuring distress after the tornado ("Overall how upset about things were you during the first few weeks after the tornado?). This stand-alone item was rated on a 4-point scale from "not at all" to "a whole lot". See **Table 2** for distribution of individual item endorsement.

Table 2

*Number of Parents Endorsing Exposure Items on the Tornado-Related Traumatic Experiences Measure*

| Item | *n* | % |
|---|---|---|
| Life-threatening events during the tornado | | |
| Doors or windows break | 13 | 12.9 |
| Get hurt | 2 | 1.8 |
| See anyone get hurt | 16 | 15.8 |
| Pet hurt or died | 1 | 1.0 |
| Hit by falling debris | 1 | 1.0 |
| No adult family member or friend around | 66 | 65.3 |
| Perceived life threat | | |
| Thought I might die | 51 | 50.5 |
| Loss or disruption events after the tornado | | |
| Home damaged or destroyed | 14 | 13.9 |
| Children attend a new school | 15 | 14.9 |
| Had to move | 11 | 10.9 |
| Lost job | 5 | 5.9 |
| Hard to see friends | 43 | 42.6 |
| No food or water | 12 | 11.9 |
| Clothes or toys ruined | 11 | 10.9 |
| Pet ran away or given away | 2 | 2.0 |
| Things stolen from home | 3 | 3.0 |
| Live away from children or partner | 4 | 4.0 |

In the current study, four variables were calculated according to a method proposed by Lochman and colleagues (2017). Two variables represent proximal exposure and distress: *traumatic events during the tornado* and *perceived life threat during the tornado* (single item coded 0, 1). For number of traumatic events, items are rated on a dichotomous scale (yes = 1 and no = 0) and are summed to create a subscale of total experiences endorsed. In the current sample, 89% of participants endorsed between zero and one traumatic event. To reduce the skew of this distribution, the variable was recoded into a dichotomous variable as 0 (no traumatic events experienced; $n = 48$) and 1 (1 or more traumatic events; $n = 52$). Individuals in the group coded 0 reported that they did not personally experience tornado-related traumatic events, even though

their community suffered considerable damage. We label this group the "community-level exposure" group. Two variables represent distal exposure and distress: *loss and disruption after the tornado* and *distress after the tornado* (single item coded 0, 1, 2, 3). For traumatic events, items are rated on a dichotomous sale (0, 1) and are summed to create a subscale of total experiences endorsed. Ninety percent of parents endorsed zero to two traumatic events after the tornado. Therefore, to reduce skew for analyses, the variable was recoded 0, 1, 2, 3 (for three or more loss-disruption events). The current study uses only the proximal exposure variable in Aim 1 and Aim 2 study analyses because we were interested in the influence of severity of the trauma event on parenting practices.

**Data Analytic Plan**

**Power analyses.** A priori power analyses were conducted using G*Power 3.1 to calculate the required sample size to achieve sufficient power (1-β) to detect mean group differences of small (.2), medium (.4), and large (.8) effect sizes. Analyses were conducted using two-tailed tests with $\alpha = .05$. Total sample sizes were 390, 100, and 28, respectively. Therefore, analyses using all participants with a final baseline sample of 240 ($n$=120 per group), as well as the reduced samples resulting from attrition ($n$=206 at time 3 follow-up), reflected a power to detect a small-to-medium effect size. Analyses for just the exposed cohort with a baseline sample of 120 reflected power to detect a medium-to-large effect size.

**Missing data and attrition.** At Time 1, parenting questionnaire data were available from 215 of the 240 families enrolled in the study; at Time 2, data were available from 237 of the 240 families; and at Time 3, data were available from 206 of these families. In total, 59 families were missing parenting data from at least one time point. Specifically, the percentage of individuals in the sample who had missing parenting data were as follows: missing one time point, 2.9%, and

missing two time points, 17.91%. Two families were missing one item the Time 2 parenting questionnaire.

Likelihood of attrition by Time 3 follow-up did not significantly differ as a function of youth gender, $\chi^2(1, 239) = 0.44$, $p = .51$; youth age, $t(238) = .34$, $p = .73$, family income, $t(238) = -.71$, $p = .48$; form completed by biological parent vs. non-biological parent $\chi^2(1, 239) = 0.25$, $p = .62$; married vs. single parent home $\chi^2(1, 239) = 1.46$, $p = .23$; or for African American vs. non-African American youth, $\chi^2(1, 239) = 0.07$, $p = .80$. However, attrition was significantly more likely among Cohort 1 families as compared to Cohort 3 families ($\chi^2(1, 239) = 16.38$, $p < .001$). Only one comparison demonstrated a significant group difference and therefore data in this study are likely best characterized by the *missing at random* assumption (Little & Rubin, 1989). For analyses involving all three study time points, Full Estimation Maximum Likelihood (FIML) was used to address missing data. FIML operates under the missing at random assumption (Olinsky, Chen, & Harlow, 2003) and estimates parameters based on complete available data. The method for addressing missing data uses all available data to obtain parameter estimates, including data from cases with missing data.

**Aim 1.** The current study used mixed effects linear models to assess whether the tornado significantly predicted changes in parenting behaviors. Change in parenting across 18 months was examined with mixed effects linear models using restricted maximum likelihood (REML) within SAS PROC MIXED, in which occasions were modeled as nested within persons. PROC MIXED, allows for the inclusion of the 59 parent-child dyads who were missing data at any assessment point under an assumption of missing at random. Given the balanced data, a saturated means, unstructured variance model was estimated, in which each mean, variance, and covariance across the three occasions was estimated separately. The time observations were

balanced across persons, and time was centered such that time 0 indicated the first observation in each model. Separate models were fit for each of the four parenting behaviors (positive discipline, inconsistent discipline, involvement, and low monitoring). Time (the repeated measure factor), tornado group (exposed vs. non-exposed), and their interaction were included in the model and select demographic variables were included as covariates based on associations with model outcomes. Specifically, we controlled for child gender, child ethnicity (African American vs. Caucasian), and annual family income because these factors were associated with differences in parenting at baseline. A significant time*group interaction would indicate that the exposed group demonstrated significantly greater changes in parenting across all time points compared to the non-exposed group.

Regardless of the interaction significance level, planned contrasts that separately analyzed change from time 1 to 2 and time 2 to 3 were used to examine possible nonlinear patterns of change across the three time points and two phases of the study. For these contrasts, piecewise slopes between adjacent occasions were first used to describe group differences in change over time. Estimated marginal means and standard errors were then used to calculate Cohen's *d* effect sizes. Statistically significant effect sizes based on 95% confidence intervals would suggest that pairwise patterns of change in parenting differed for each group.

**Aim 2.** To assess if degree of exposure moderated the change in parenting behaviors over time, four additional mixed effects linear models were estimated. The dependent variables in these models were each of the parenting behaviors: positive discipline, involvement, low monitoring, and inconsistent discipline. For these analyses, only parent-child dyads exposed to the tornado ($n$=120; Cohort 3) were selected. Each model was specified according to the method described above. Specifically, effects were compared for parents with community-level exposure

versus those with direct proximal exposure (1 or more trauma events endorsed). Time (the repeated measure factor) and tornado group (community-level vs. direct proximal exposure) were included in the model and child gender, ethnicity, and annual family income were included as covariates. A significant group*time interaction would indicate that the direct exposure group demonstrated significantly greater changes in parenting across all time points compared to the community-level exposure group.

Similar to the process for Aim 1, regardless of whether the overall interaction effect was significant, planned contrasts that separately analyzed slopes between adjacent occasions were used to describe group differences in change over time across the two phases of the study (pre- to immediately post-tornado and immediately post- to 12-months post-tornado). Cohen's *d* values were calculated based on estimated marginal means to determine the effect size for slope comparisons. Statistically significant effect sizes based on 95% confidence intervals would suggest that patterns of change in parenting for the direct exposure and community-level exposure groups differed significantly.

## Results

### Correlations and Descriptive Statistics

Zero-order correlations between parent-reported parenting behaviors at all study time points and post-traumatic stress reactions are presented for the full study sample in **Appendix II.** Associations among parent-reported parenting behaviors were in expected directions; the positive parenting behavior of involvement was generally associated with lower levels of inconsistent discipline and higher levels of monitoring. Positive discipline was negatively correlated with low monitoring but not inconsistent discipline across all study time points. Negative parenting behaviors (e.g., inconsistent discipline and low monitoring) and positive

parenting behaviors (e.g., positive discipline and involvement) were generally negatively associated with each other.

At time 1 and follow-up points, several differences emerged among the parenting behavior variables. Means, standard deviations, and associations for each time 1 parenting behavior by gender, ethnicity, and parent marital status are presented for the full sample in **Table 3.** At baseline, parents of girls reported more use of positive discipline compared to parents of boys ($t(164.99) = -2.13$, $p<.05$) and parents of African American youth reported less monitoring compared to other ethnicities ($t(213) = 2.48$, $p<.05$). Notably, parents from single-parent homes reported less monitoring at time 2 ($t(235.99) = 3.22$, $p<.01$) and time 3 ($t(207.16) = 4.10$, $p<.001$) compared to parents from dual-parent homes. Furthermore, family income level was significantly and negatively correlated with low monitoring ($r = -.15$, $p<.05$). No other differences in parenting behaviors emerged as a function of gender, ethnicity, or marital status.

An intraclass correlation (ICC) (as calculated from an empty means, random intercept only model) was calculated for each parenting practice. The ICC for inconsistent discipline was estimated at .59, indicating that 59% of the variance in inconsistent discipline was due to between-person mean differences, whereas 41% was due to within-person residual variation over time. The ICC's for positive discipline, involvement, and low monitoring were estimated at .60, .64, and .45, respectively. As noted, for all parenting behaviors, the results reported below are from an unstructured structure variance–covariance matrix, which estimated all possible covariances and variances for all three outcomes (time points).

Table 3

*Descriptive Statistics at Time 1 Among All Study Variables*

| | Involvement | Monitoring | Positive Discipline | Inconsistent Discipline |
|---|---|---|---|---|
| Gender | | | | |
| Male (*n*=159) | 39.19 (5.23) | 14.04 (4.23) | 26.21 (3.10)* | 14.72 (3.79) |
| Female (*n*=81) | 40.51 (5.13) | 13.14 (3.42) | 27.07 (2.63) | 14.57 (4.53) |
| Ethnicity | | | | |
| African American (*n*=186) | 39.46 (5.44) | 14.10 (4.08)* | 26.55 (2.99) | 14.75 (3.86) |
| Other[a] (*n*=54) | 40.20 (4.53) | 12.51 (3.44) | 26.31 (2.93) | 14.39 (4.63) |
| Parental Marital Status | | | | |
| Married (*n*=86) | 40.11 (4.39) | 13.15 (3.58) | 26.53 (2.66) | 14.33 (3.97) |
| Single-parent household (*n*=149) | 39.36 (5.65) | 14.07 (4.18) | 26.48 (3.15) | 14.86 (4.09) |

*$p<.05$, **$p<.01$

*Note:* All comparisons made with independent samples t-tests

[a] Composition of "Other" group was 18.3% Caucasian, 1.7% Hispanic, 0.4% Native American, 0.4% Biracial, and 1.7% Unknown.

**Aim 1: Did the tornado influence changes in parenting behaviors?**

**Table 4** presents the results of mixed effects linear models predicting exposure effects on parenting behaviors across all three study time points. The models predicting inconsistent discipline, positive discipline, and low monitoring revealed a non-significant overall effect of group and time*group interaction, but significant overall effects of time, indicating that all parents, regardless of exposure, had similar trajectories of these parenting behaviors across the 18-month study period. For all parents, inconsistent discipline (see **Figure 1**) and positive

discipline decreased over time on average, $F(2, 219) = 9.56$, $p < .001$ and $F(2, 220) = 4.47$, $p < .05$, respectively. Low monitoring increased over time on average, $F(2, 219) = 7.86$, $p < .001$.

Despite the absence of interaction effects for each parenting behavior, piecewise slopes models were then fitted to describe individual trajectories of change across the two phases of the study: (1) changes in parenting from time 1 to 2; and (2) changes in parenting from time 2 to 3. **Table 5** presents all estimated marginal means and pairwise group comparisons across specific study time points. Based on effect sizes representing degree of change (mean gain scores) calculated from estimated marginal means, the slopes of inconsistent discipline, positive discipline, and low monitoring did not differ significantly by exposure condition, across all adjacent occasion comparisons. Effect sizes were small and non-significant for all pairwise comparisons (*d*'s = .009- .14).

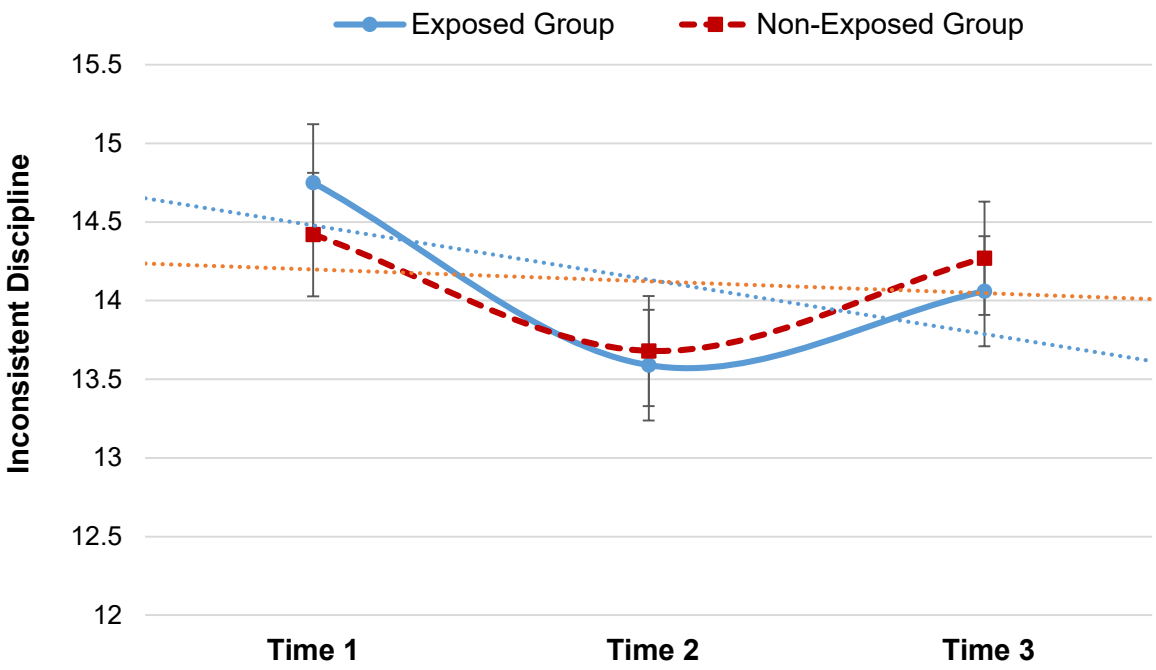


**Figure 1.** Tornado exposure effects on parent-reported inconsistent discipline (fitted estimates based on mixed linear model, REML estimation, +/- 1 SE).

Table 4

*Full Results of Mixed Effects Linear Models Predicting Tornado Effect on 18-Month Trajectories on Parenting Behaviors*

| | Positive discipline | | | Involvement | | | Low monitoring | | | Inconsistent discipline | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | SE | *p* | *B* | SE | *p* | *B* | SE | *p* | *B* | SE | *p* |
| Intercept | 25.86 | .42 | <.001*** | 49.67 | .74 | <.001*** | 15.56 | .53 | <.001*** | 14.45 | .52 | <.001*** |
| Caucasian youth (vs. African American youth) | -.27 | .43 | .54 | -.64 | .76 | .40 | -1.36 | .50 | <.01** | -.25 | .55 | .65 |
| Male gender (vs. female gender) | .37 | .36 | .31 | .86 | .64 | .18 | -.81 | .42 | .06 | -.12 | .47 | .80 |
| Annual family income | .001 | .06 | .99 | .17 | .10 | .10 | -.15 | .07 | .03 | -.06 | .07 | .39 |
| Time | .54 | .26 | **.04*** | -.77 | .45 | **.08**[#] | -.94 | .37 | **.01*** | .70 | .35 | **.046*** |
| Group | .17 | .42 | .68 | -.50 | .74 | .50 | .06 | .59 | .92 | .25 | .50 | .63 |
| Group*Time | -.04 | .39 | .93 | .21 | .66 | .76 | -.17 | .64 | .79 | -.55 | .51 | .29 |

*$p < .05$, ** $p < .01$, ***$p < .001$

Table 5

*Estimated Marginal Means and Standard Errors of the Mean Calculated From Mixed Effects Linear Models, and Effect Sizes Comparing Mean Gain Scores (Cohen's d)*

| Outcome Variable | Exposed | | | Non-Exposed | | | Cohen's *d,* based on mean gain scores [95% CI] | | |
|---|---|---|---|---|---|---|---|---|---|
| | M(SE) Time 1 | M(SE) Time 2 | M(SE) Time 3 | M(SE) Time 1 | M(SE) Time 2 | M(SE) Time 3 | Time 1 to Time 2 | Time 2 to Time 3 | Time 1 to Time 3 |
| Positive Discipline | | | | | | | | | |
| | 26.48 | 26.53* | 25.93* | 26.61 | 26.44 | 26.11 | .08 | .09 | .01 |
| | (.271) | (.269) | (.292) | (.288) | (.268) | (.300) | [-.17, .34] | [-.16, .35] | [-.24, 26] |
| Low Monitoring | | | | | | | | | |
| | 13.83 | 13.34* | 14.29 | 13.64 | 13.10** | 14.27 | .009 | .05 | .03 |
| | (.363) | (.313) | (.413) | (.394) | (.311) | (.424) | [-.24, .25] | [-.20, .30] | [-.21, .29] |
| Involvement | | | | | | | | | |
| | 39.82 | 40.46 | 40.60 | 39.62* | 40.46 | 40.19 | .05 | .09 | .04 |
| | (.480) | (.456) | (.516) | (.506) | (.453) | (.528) | [-.30, .21] | [-.17, .34] | [-.21, .29] |
| Inconsistent Discipline | | | | | | | | | |
| | 14.75*** | 13.59 | 14.06* | 14.42* | 13.68 | 14.27 | .13 | .03 | .14 |
| | (.371) | (.352) | (.350) | (.392) | (.350) | (.360) | [-.13, .38] | [-.22, .29] | [-.12, .39] |

*Note:* Cohen's *d* reflect change in parenting behaviors from Time 1 to Time 2 and Time 3 change for parents-child dyads exposed to the tornado vs. dyads not exposed to tornado. * indicates a significant pairwise comparison within each group.

**Aim 2: Examining effects of degree of tornado exposure on parenting.** Among the exposed group, associations between the TORTE variables for parents' reports of tornado-related experiences and parenting behaviors within the year after the tornado (time 3) were examined (see **Table 6**). Parents' fear that they might die during the tornado was found to be related to higher parental inconsistent discipline ($t(104) = -2.22$, $p < .05$). Inconsistent discipline was also positively correlated with proximal exposure ($r = .27$, $p < .01$), distress in the first few weeks after the tornado ($r = .20$, $p < .05$), and distal exposure ($r = .25$, $p < .01$). Low monitoring was associated with higher number of traumatic events experienced during the tornado ($r = .20$, $p < .05$). All other associations between TORTE variables and parenting behaviors at Time 3 were non-significant.

**Table 6** presents the results of mixed effects linear models predicting proximal exposure effects on parenting behaviors across all three study time points. For inconsistent discipline, significant mean differences in group, time, and time*group interaction were observed across occasions, ($\beta=1.57$, $SE=.76$, $t(103)=2.08$, $p<.05$), indicating that parents with community-level exposure, compared to those with direct proximal exposure, experienced a greater decrease in inconsistent discipline across the 18-month follow-up period. Thus, overall, there were significant group differences in rates of change of inconsistent discipline. Specifically, there was a significant time effect for the community-level exposure group ($\beta=1.47$, $SE=.54$, $t(103)=2.69$, $p<.01$), but not for the direct exposure group ($\beta=-.10$, $SE=.52$, $t(103)=-.20$, $p=.84$), indicating that the community-level exposure group decreased their inconsistent discipline significantly across the full study period while the direct exposure group remained at a high, stable level. Further, at time 3, parents in the direct exposure group reported significantly higher overall

levels of inconsistent discipline compared to those in the community-level exposure group (β=-1.60, *SE*=.75, t(102)=-2.13, *p*<.05).

Table 6

*Associations Among Parenting Behaviors at Time 3 and TORTE Variables*

| | Pos3 | Inv3 | Mon3 | Incon3 | Life Threat | Prox Exposure | Overall Upset | Distal Exposure |
|---|---|---|---|---|---|---|---|---|
| Pos3 | -- | .62** | -.16* | -.13 | .01 | -.09 | -.01 | .02 |
| Inv3 | | -- | -.34** | -.26** | .01 | -.04 | -.02 | -.05 |
| Mon3 | | | -- | .37** | .02 | **.20*** | -.007 | .04 |
| Incon3 | | | | **--** | **.21*** | **.27**** | **.20*** | **.25**** |
| Life Threat | | | | | **--** | **.21**** | **.25**** | **.31**** |
| Prox Exposure | | | | | | **--** | **.16**** | **.54**** |
| Overall Upset | | | | | | | **--** | **.32**** |
| Distal Exposure | | | | | | | | **--** |

*$p < .05$, ** $p < .01$, ***$p < .001$. *Note:* Pos3 = positive discipline time 3; Inv3 = involvement time 3; Mon3 = low monitoring time 3; Incon3 = inconsistent discipline time 3; prox = proximal; overall upset = overall how upset were you in the first few weeks after the tornado.

Piecewise slopes were then fitted to describe individual trajectories of change across the two phases of the study (see **Table 7**): (1) changes in parenting immediately post the tornado (time 1 to 2); and (2) changes in parenting 12 months post the tornado (from time 2 to 3). The community-level exposure group reported trend-level greater decreases in inconsistent discipline from time 2 to 3 compared to the direct exposure group (β=-.98, SE=.62, t(103)=-1.59, p=.11) with an effect size in the small-to-medium range (*d* = .26). In contrast, the Cohen's *d* effect size

was small and non-significant for phase 1, suggesting that patterns of change were similar for both groups from time 1 to 2 (see **Figure 2;** *d* =.14).

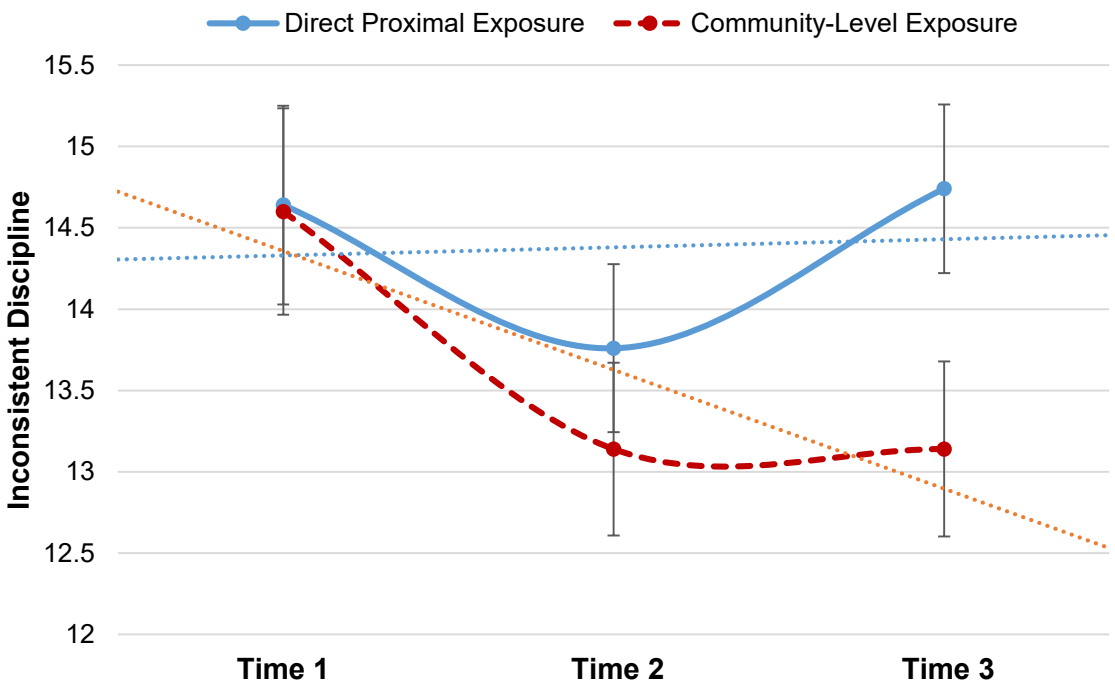


**Figure 2.** Proximal exposure effects on parent-reported inconsistent discipline among tornado-exposed parents (fitted estimates based on mixed linear model, REML estimation, +/- 1 SE).

Table 7

*Full Results of Mixed Linear Models Predicting Proximal Exposure Effect on 18-Month Trajectories of Parenting Behaviors*

| | Positive discipline | | | Involvement | | | Low monitoring | | | Inconsistent discipline | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | SE | *p* | *B* | SE | *p* | *B* | SE | *p* | *B* | SE | *p* |
| Intercept | 25.37 | .62 | <.001*** | 39.31 | 1.05 | <.001*** | 16.63 | .83 | <.001*** | 15.09 | .83 | <.001*** |
| Caucasian youth (vs. African American youth) | .52 | .58 | .89 | .47 | .97 | .63 | -1.39 | .73 | .06 | -.76 | .84 | .37 |
| Male gender (vs. female gender) | .22 | .54 | .69 | .59 | .91 | .52 | -1.00 | .68 | .14 | .10 | .78 | .90 |
| Annual family income | -.04 | .08 | .67 | .16 | .14 | .26 | -.21 | .11 | .048* | -.04 | .12 | .72 |
| Time | .59 | .34 | **.08**# | -.74 | .67 | .27 | -1.54 | .55 | **.006**** | -.98 | .43 | **.02*** |
| Group | .89 | .62 | .15 | .44 | 1.06 | .68 | -1.50 | .88 | **.09**# | -1.60 | .75 | **.03*** |
| Group*Time | .13 | .53 | .81 | -.27 | .97 | .78 | -1.81 | .99 | **.07**# | 1.57 | .76 | **.04*** |

*$p < .05$, ** $p < .01$, ***$p < .001$

*Note*: Proximal exposure is coded as 0 = 0 events endorsed vs. 1 = 1 or more events endorsed.

Table 8

*Estimated Marginal Means and Standard Errors of the Mean Calculated From Mixed Effects Linear Models for Proximal Exposure and Effect Sizes Comparing Mean Gain Scores (Cohen's d) for Follow-up Analyses*

| Outcome Variable | 1 or More Events | | | 0 Events | | | Cohen's *d,* based on mean gain scores [95% CI] | | |
|---|---|---|---|---|---|---|---|---|---|
| | M(SE) Time 1 | M(SE) Time 2 | M(SE) Time 3 | M(SE) Time 1 | M(SE) Time 2 | M(SE) Time 3 | Time 1 to Time 2 | Time 2 to Time 3 | Time 1 to Time 3 |
| Positive Discipline | | | | | | | | | |
| | 25.81 | 25.98 | 25.39 | 26.83 | 26.93 | 26.28 | .03 | .02 | .04 |
| | (.392) | (.353) | (.428) | (.407) | (.365) | (.444) | [-.35, .40] | [-.29, .34] | [-.31, .39] |
| Low Monitoring | | | | | | | | | |
| | 13.70 | 13.48 | 15.02** | 14.01 | 13.11 | 13.52 | .18 | .29 | **.41** |
| | (.567) | (.439) | (.609) | (.589) | (.453) | (.633) | [-.21, .57] | [-.12, .70] | **[.001, .83]** |
| Involvement | | | | | | | | | |
| | 39.61 | 40.57 | 40.35 | 39.77 | 40.26 | 40.79 | .11 | .16 | .06 |
| | (.661) | (.572) | (.734) | (.687) | (.594) | (.761) | [-.24, .45] | [-.14, .45] | [-.31, .43] |
| Inconsistent Discipline | | | | | | | | | |
| | 14.64 | 13.76 | 14.74* | 14.60 | 13.14** | 13.14 | .14 | **.26** | **.37** |
| | (.611) | (.516) | (.518) | (.635) | (.530) | (.538) | [-.18, .46] | **[-.06, .58]** | **[.02, .73]** |

$^{\#}p<.10$, $*p < .05$, $** p < .01$

*Note:* Cohen's *d* reflect change in parenting behaviors from Time 1 to Time 2 and Time 3 change for parents-child dyads with direct proximal exposure ($n$=52; 1 or more events) vs. dyads with community-level exposure ($n$=48*;* 0 events endorsed). Significant Cohen's *d*s are represented by 95% CI that do not include 0 and are in bold. * indicates a significant pairwise comparison within each exposure group.

Regarding low parental monitoring, the mixed effects linear model revealed a significant overall effect of time and non-significant overall effects of group and group*time interaction. These results suggest that direct exposed parents did not report more rapid increases in low monitoring across the 18-month follow-up period, compared to community-level exposure parents. However, both the overall group effect (β = -1.50, *SE*=.88, t(104)=-1.75, *p* =.09) and the group*time interaction (β=1.81, *SE*=.99, t(104)=1.84, *p*=.07) were trend-level effects, suggesting that there was a trend for direct exposed parents to increase low monitoring over the 18-month period at a higher rate compared to community-level exposed parents (see **Figure 3;** *d*=.41). Piecewise slopes describing individual trajectories immediately post the tornado (time 1 to 2) and 12 months post the tornado (time 2 to 3) revealed that increases in low monitoring across the two phases of the study did not significantly differ by exposure condition, although the effect size from time 2 to 3 was in the small-to-medium range numerically (*d*=.29).

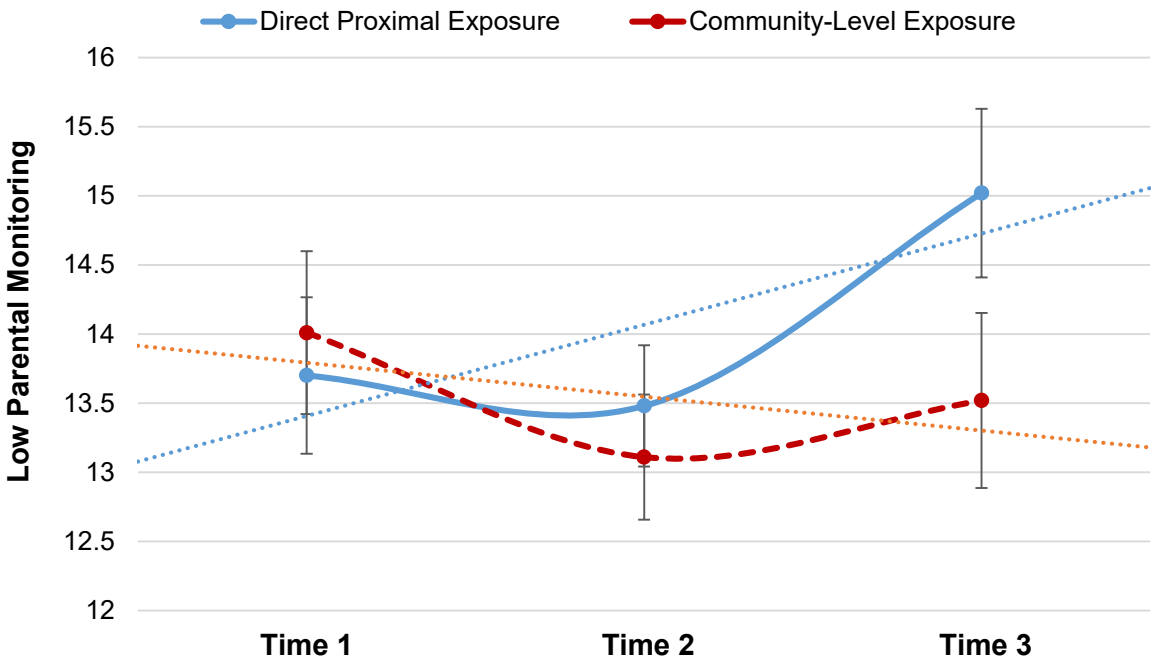


**Figure 3.** Proximal exposure effects on parent-reported low monitoring among tornado-exposed parents (fitted estimates based on mixed linear model, REML estimation, +/- 1 SE).

Regarding proximal exposure effects on positive discipline, the mixed effects linear models demonstrated a marginally significant effect of group and time, and a non-significant overall group*time interaction (see **Figure 4**). That is, both groups had similar, non-significant decreasing trajectories across the 18-month period (β=.42, *p*=.26 and β=.55, *p*=.16 for direct and community-level exposure groups, respectively). Finally, the mixed effect linear model predicting proximal exposure effects on involvement demonstrated a non-significant overall effect of time, group, and group*time interaction. These results indicated that direct exposed parents did not experience more rapid declines in involvement across the full 18-month study period, compared to parents in the community-level exposure group. All effect sizes for pairwise group comparisons for both positive discipline and involvement were small and non-significant (*d*'s=.03-.16).

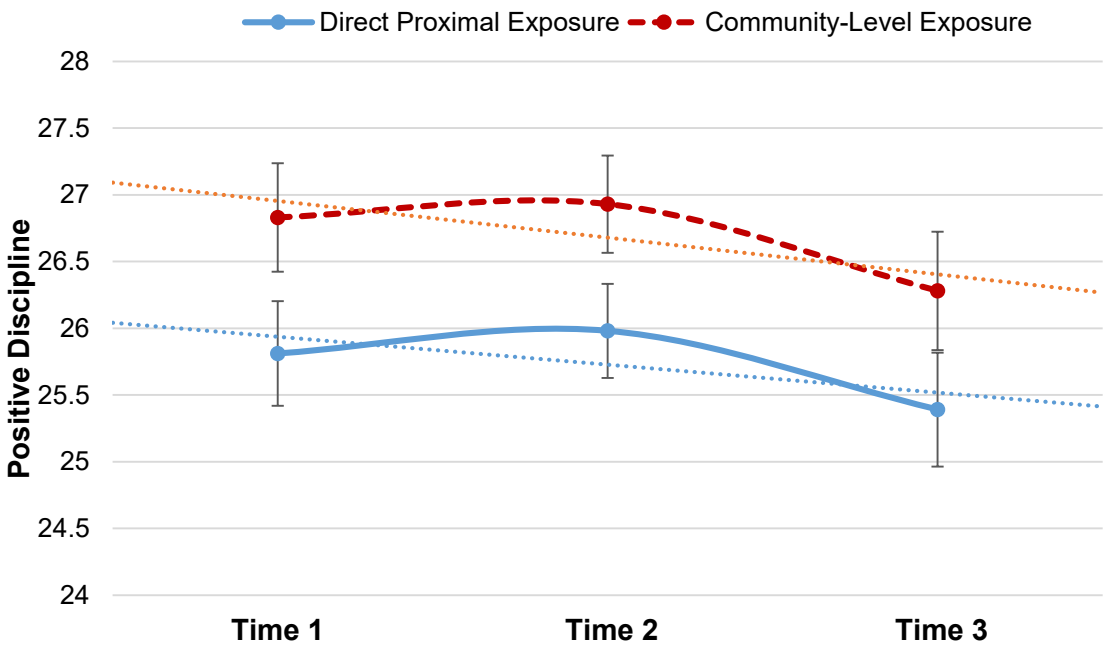


**Figure 4.** Proximal exposure effects on parent-reported positive discipline among tornado-exposed parents (fitted estimates based on mixed linear model, REML estimation, +/- 1 SE).

## Discussion

The goal of the current study was to provide a greater understanding of the ways in which exposure to devastating natural disasters influence parenting practices and quality over time. Drawing from an ecological framework (Bronfenbrenner & Morris, 2006) to assess the proximal and distal factors that influence parenting, we posited that exposure to a devastating tornado would alter parental discipline and monitoring strategies over an 18-month period pre- to post-disaster. The influence of severity of disaster exposure on parenting behaviors was also examined. This study is among the first to investigate the effects of a natural disaster using a natural experimental design that included non-exposed and tornado-exposed groups of the same age and drawn from the same communities. This study is also one of the first to incorporate assessments from before and after the disaster event. Although rates of change in the four dimensions of parenting behaviors measured here did not differ at a statistically significant level in analyses comparing the non-exposed and tornado-exposed cohorts (Aim 1), analyses comparing parents in the tornado-exposed cohort who reported direct proximal trauma exposure with those who did not, provide preliminary support that severity of disaster exposure influences the trajectory of parental inconsistent discipline, particularly in the long-term aftermath of the disaster. Further, most parenting research has been conducted with middle-class, Caucasian families, and the sample for current study was predominantly African American youth from low-income families who were identified as at-risk for aggressive behaviors. Therefore, this study offers a unique opportunity to explore the association between disaster exposure and parenting among an underrepresented group in the disaster and parenting literature. Findings for the two research questions and implications for post-disaster interventions are discussed below.

### Assessing Parenting among Tornado Exposed and Non-Exposed Families

The first aim of the study was to compare patterns of change in parenting behaviors among parent-child dyads in the tornado-exposed and non-exposed groups. Interestingly, we found that three of the four types of parenting behaviors changed over the full study period, regardless of exposure group. Specifically, inconsistent and positive discipline significantly decreased on average, and low monitoring significantly increased on average, over the study period. The natural experimental design enabled us to show that these changes were not explained by living in the community when the tornado hit in 2011 versus living in the community prior to the tornado. That is, overall, caregivers in the tornado-exposed and non-exposed groups did not differ systematically in terms of changes in parenting practices across the 18-month study period. There are several possible explanations for these results. First, although all children in the current study were at-risk due to elevated levels of aggression, they all participated in a school-based preventive intervention during their 4$^{th}$ and 5$^{th}$ grade years. These findings suggest that participation in an evidence-based prevention program with a focus on emotion regulation and cognitive reappraisal skills may have had a positive influence on parenting practices regardless of exposure to the tornado. This idea is consistent with emerging literature on pre-existing school-based mental health programs and natural disasters (Masten & Narayan, 2012). To date, two studies have demonstrated that participation in a school mental health program that was embedded into the school curriculum prior to the disaster was associated with fewer PTS symptoms following exposure to war-related terror and a devastating earthquake. One study examined PTS symptoms 9 months after an 8.8 magnitude earthquake in Chile among children who participated in an ongoing preventive mental health school-based intervention both prior to and 3-6 months after the disaster (Garfin et al., 2014). Results suggested that participation in the intervention was associated with less earthquake-related worry

compared to earthquake-exposed children in schools that were not participating in the preventive program. Similarly, in another study conducted in a high-risk area in Israel, a universal school-based preventive intervention for stress management was embedded into several schools' curricula (Wolmer, Hamiel, & Laor, 2011). Following a three-week episode of armed conflict and rocket attacks, children who had received the pre-existing intervention were compared with children from schools who did not receive the intervention. The findings suggested that the intervention, implemented prior to the trauma exposure, buffered against the development of PTS symptoms. Results from these studies highlight the potential for preventive interventions in the school setting, delivered prior to and following mass trauma exposure, to be a salient protective factor for youth and families, particularly in areas that are prone to disasters or war-related conflicts.

Second, a lack of significant differences among the exposed versus non-exposed groups may be due to the fact that, among parents in the exposed group, about one-third of parents reported that they had not personally experienced any of the tornado-related traumatic events measured by the TORTE, even though their community suffered considerable damage. As noted earlier, and consistent with previous literature (see Bonanno et al. (2010) for a discussion), a range of exposure severity is an essential contextual factor to consider when evaluating the influence of disaster exposure on families. Much research has found support for a dose-response model of trauma exposure in which greater frequency, number, or severity of the trauma is generally associated with higher symptomology, even though a number of personal and environmental factors may moderate this dose-response effect (Masten & Narayan, 2012). It is notable that, in this study, there was limited variability of exposure level and most individuals in the exposed group reported low to moderate exposure. In fact, only 11 parents reported

experiencing greater than two traumatic events during the tornado. As a result, patterns of parenting may be similar for both groups because many individuals within the exposed group did not experience significant trauma.

**Level of Disaster Exposure and Parenting Trajectories**

Although patterns of change in parenting did not differ when comparing families in the exposed and non-exposed cohorts overall, significant differences in trajectories emerged when examining severity of tornado exposure within the exposed group. Natural disasters can have a devastating impact on children and their families. Contextual elements of the disaster, such as threat to life (Green et al., 1991), personal loss (Lonigan, Shannon, Finch, Daugherty, & Taylor, 1991), social support (La Greca et al., 2013a) and number of traumatic events experienced, are consistently associated with disaster response and recovery. In the present study, direct exposure to tornado-related trauma moderated parenting trajectories such that parents who endorsed one or more proximal exposure items, maintained high, stable levels of inconsistent discipline from before to one-year after the disaster, whereas inconsistent discipline among parents who had only community-level exposure decreased over time. This pattern for the community-level exposure group is consistent with the findings that emerged from Aim 1 in which the overall trend was for parents to report less inconsistent discipline over time. The results from Aim 2 demonstrate that experiencing a greater number of traumatic events during the tornado alters the expected declining trajectory of inconsistent discipline. Stated in another way, experiencing 1 or more disaster-related traumatic events kept inconsistent discipline high. Although the effect size is in the small-to-medium range ($d$=.37), the disaster's impact on consistency of parental discipline, despite youth participation in an intervention aimed at reducing their behavioral problems, highlights the robustness of the effect.

Notably, for inconsistent discipline no differences in patterns of change for the direct exposure and community-level exposure groups emerged from before to immediately after the tornado (time 1 to 2). However, the trajectories for these two groups began to diverge in the year following the tornado (time 2 to 3; *d*=.26). That is, the impact of the tornado on inconsistent parenting was not noticeable until 12 months post-disaster, suggesting that there are long-term consequences of disaster exposure on parents' abilities to engage with their children that are not discernable immediately after the disaster. The results expand previous disaster research and indicate that the environmental context and degree of trauma influences consistency of parenting specifically in the long-term aftermath of the disaster. These findings also suggest that exposure to multiple traumatic events during a disaster has a unique effect on parents' post-disaster adjustment above and beyond the individual characteristics of the child and economic resources of the family (e.g., the gender, ethnicity, family income).

Another potentially important finding is the trend-level effect of proximal exposure that emerged for low parenting monitoring. Parents with direct proximal exposure, compared to those who experienced community level exposure, reported trend-level greater increases in low monitoring (*d*=.41) from pre-tornado to 12-month follow-up. This finding is consistent with previous research indicating that recovery-related demands, such as financial distress and caregiver emotional distress, interfere with parents' ability to remain emotionally available for their children (Weems & Overstreet, 2008). In general, the existing parenting literature has demonstrated an association between economic hardships and low parental monitoring and involvement (Conger et al., 2002; Norris et al., 2002; Sobolewski & Amato, 2005). Further, monitoring behaviors often decrease as parents allocate time to recovery activities such as rebuilding houses, moving, and finding appropriate resources (Weems & Overstreet, 2008).

Although this effect only reached a trend-level of statistical significance, the result may be noteworthy because the study analyses for Aim 2 did not have enough statistical power detect small-to-medium effects.

**Natural Disasters and Preventive Interventions**

The school is one microsystem that may influence post-disaster adjustment. Several studies have noted that a fast return to normal school routines facilitates youth's resiliency following disaster exposure (Betancourt et al., 2010; Kronenberg et al., 2010). For example, the school appears to be an ideal setting to deliver effective large scale post-disaster interventions to children, given that children spend a large percentage of their time in school settings (Chemtob, Nakashima, & Hamada, 2002). When family resources are depleted due to a disaster, schools can provide resources (e.g., shelter, medical care) and security in the devastated communities (Kilmer, Gil-Rivas, & MacDonald, 2010). Many school-based interventions train teachers to deliver interventions and to help alleviate trauma-related distress (Wolmer et al., 2011). In one study, helping children to cognitively process the trauma events and reducing negative rumination were associated with adaptive post-traumatic functioning (Kilmer et al., 2010). Thus, a school-based intervention may be an effective mechanism to deliver supports to children and families after disasters (Kilmer et al., 2010).

Components of the preventive intervention administered in the schools prior to the Alabama tornado (e.g., learning emotional expression, adaptive coping skills) shared many similarities with components of interventions designed specifically for children following disaster exposure (see Vernberg et al., 2016; Vernberg et al., 2008). For this reason, participation in the intervention may have minimized the degree to which parenting behaviors changed in response to trauma exposure, particularly among an at-risk group of youth. Children learned

coping and behavioral regulation skills and may have, therefore, elicited lower levels of frustration and harsh discipline from parents. Expanding the implementation of school-based interventions, particularly in areas prone to frequent disasters, may be one way to reduce the detrimental impact of disasters on family functioning and youth adjustment in the aftermath of devastating disasters. Given the vulnerability of low socioeconomic populations to increased distress from cumulative stressors (Foa, Stein, & McFarlane, 2006), this study highlights that school-based interventions may be one method through which to protect youth against the development of psychopathology.

**Cultural Influences on Parenting**

Parents and youth in the current sample were predominantly African American. As noted previously, while there are many commonalities across cultures regarding large-scale parenting goals, the ways in which these goals are achieved may vary across diverse groups. For example, parents from different cultures may hold certain beliefs and cognitions that, in turn, influence parenting practices (Cole & Tan, 2015). In the current study, inconsistent discipline and low monitoring emerged as the two parenting practices most likely to be effected by the disaster. While consistent parenting is a widely established protective factor for children's development, results of the present study may not be generalizable to other ethnic and racial groups. Ultimately, any parenting intervention targeting post-disaster adjustment should be mindful of cultural variations in parenting. Programs, particularly those implemented in the long-term aftermath of disasters, should consider the distinct effects of a disaster on parenting practices and quality over time across diverse groups.

**Strengths, Limitations, and Future Directions**

The study has several notable strengths. First, this study is among the first to investigate the effects of a natural disaster using a natural experimental design that included non-exposed and exposed cohorts of the same age and drawn from the same communities. The natural experimental design framework is a noteworthy feature of this study because it illuminates that simple exposure versus no exposure is not a sufficient way to evaluate the impact of disasters. That is, there are more nuanced elements of the disaster context, such as number of traumatic events experienced during the disaster, which may contribute to family adjustment over time. As level of disaster adversity rises, there is often a corresponding increase in psychopathology and behavioral concerns in both children and adults (Norris et al., 2002). These findings regarding risk gradients and cumulative risk have been consistently replicated across the developmental and trauma literature more broadly (Obradović, Shaffer, & Masten, 2012). Further, this study is among the first to incorporate assessments from before and after the disaster event and it is the first project to explore pre-to-post disaster trajectories of parenting behaviors. Finally, the current sample is composed predominantly of African American children and of children who were identified as at-risk for aggression in the fourth grade. Study results highlight the parenting behaviors that are most likely to be affected by disasters among a low-income, at-risk, predominantly African American sample.

This study has several limitations that may be useful to consider when planning and implementing future research. First, the study utilized a parent self-report measure to assess parenting behaviors. However, parents may be less willing to admit to negative parenting strategies and more likely to over-endorse positive parenting practices such as involvement and positive discipline. Self-report tools may be particularly unreliable in the context of a traumatic disaster as distress may bias both the assessment of their child's behaviors and self-assessment

(Eisenberg & Silver, 2011). In the current study, it is notable that parents reported high and stable levels of involvement and positive discipline regardless of level of exposure. Assessing parenting behaviors using interviews with parents alone and in conversation with their children may be a valuable and reliable future approach to measuring changes in parenting over time. Utilizing qualitative interviews allows for objective measurement of parent-child communication patterns, rather than relying on parents' reports of their own behaviors.

Second, research examining children and parents' post-disaster adjustment has primarily used a variable-centered approach. This method focuses on group averages over time (e.g., La Greca et al. 1996, 1998; Pina et al. 2008). Although this approach is valuable, examining average levels of behaviors makes it difficult to examine individual variation from the mean. That is, many individuals are resilient in the face of trauma exposure, while others demonstrate worse symptomology at similar levels of trauma severity (reflecting vulnerability) (Bonanno, Brewin, Kaniasty, & La Greca, 2010; La Greca et al., 2013a). For this reason, it is important to consider individual trajectory groups and to examine the risk and protective factors, such as familial support or pre-existing child characteristics, that may contribute to these unique pathways of adjustment over time. Future research examining trajectory groups may reveal unique variations in parenting that are obscured by examining parenting trends on average.

Third, the majority of parents in the current sample were mothers. There has been an increasing focus in recent literature on the role that fathers play in fostering their children's development. Several studies have suggested that mothers and fathers interact in varying ways with their children, particularly regarding harsh and inconsistent discipline strategies (Deater-Deckard & Dodge, 1997; McKee, Roland, Coffelt, Olson, Forehand, et al., 2007). Future research should examine the influence of shared trauma experiences on fathers' parenting and

how fathers exposed to trauma may differentially influence their children's psychosocial outcomes. Finally, prior research has demonstrated that caregivers' availability to discuss a trauma in the short-term aftermath of a disaster is protective against children's distress (Gil-Rivas et al., 2007; Bromet et al., 2000). Future research should assess parenting, as well as change in parenting, as a potential mechanism that mediates the link between disaster trauma and youth's long-term self-regulation.

Ultimately, when designing post-disaster interventions, policy makers and clinicians should consider the benefit of training caregivers in effective ways to stay available to their children and provide them with consistent support in the months following the disaster. For example, caregivers may be told how to issue effective commands, communicate honestly, and normalize children's distress responses (Kar, 2009). Other examples of effective parent training may include teaching caregivers how to provide information to their children in an age-appropriate manner. These components of parent training are all elements of consistent parental discipline and may promote optimal outcomes for youth post-disaster. Parenting interventions may be particularly important after natural disasters because these traumas are community events in which parents and children share the trauma exposure and parents must manage both their own and their children's distress responses and recovery demands.

**Conclusions**

Parenting occurs within a broader ecological framework (Bronfenbrenner & Morris, 2006). Behaviors and emotions are influenced by a myriad of factors, including child behavior, culture, and financial strain which, in turn, can influence parenting practices and quality. The current study demonstrated how one of these proximal factors, the distress brought on by a devastating natural disaster, directly influenced parenting practices and quality over time.

Specifically, the consistency of discipline and level of monitoring appear to be vulnerable in the long-term aftermath of the natural disasters. These findings may inform how disaster aid agencies allocate and target limited resources following disasters, including disseminating social support services to families not only in the immediate aftermath of the trauma but over time as well. Adults and, in particular, parents, play an essential role in helping children demonstrate posttraumatic growth following disasters, including implementing interventions in familiar settings (e.g., school) with familiar people (Vernberg et al., 2016). Structure and routine, especially in familiar settings, can help youth adjust despite the potentially chaotic disruption from the disaster (Pfefferbaum & Shaw, 2013). This study emphasizes the importance of programs and policies to support parents and to help them be sensitive, responsive, and attentive to their children even while facing stress and psychological distress themselves. The results help to clarify how certain family processes, most notably consistency of discipline and monitoring, are impacted by severity of traumatic disasters and may, therefore, inform public policies that support efficient and effective disaster recovery for parents and children.

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## Appendix I

*Data Collection Timeline*

| | Winter 2009 | Summer 2009 | Winter 2010 | Summer 2010 | Winter 2011 | Tornado April 27th, 2011 | Summer 2011 | Summer 2012 |
|---|---|---|---|---|---|---|---|---|
| Cohort 1 | T1: During 4th Grade | T2: Summer After 4th Grade | ___ | T3: Summer After 5th Grade | ___ | | T4: Summer After 6th Grade | T5: Summer After 7th Grade |
| Cohort 2 | | | T1: During 4th Grade | T2: Summer After 4th Grade | ___ | | T3: Summer After 5th Grade | T4: Summer After 6th Grade |
| Cohort 3 | | | | | T1: During 4th Grade | | T2: Summer After 4th Grade | T3: Summer After 5th Grade |

*Note*: T1 = Time 1. T2 = Time 2. T3 = Time 3. T4 = Time 4.

**Appendix II**

*Correlations Among Primary Study Outcomes*

| | Pos1 | Inv1 | Incon1 | Mon1 | Pos2 | Inv2 | Incon2 | Mon2 | Pos3 | Inv3 | Incon3 | Mon3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pos1 | -- | | | | | | | | | | | |
| Inv1 | **.64**** | -- | | | | | | | | | | |
| Incon1 | -.03 | **-.17*** | -- | | | | | | | | | |
| Mon1 | -.12 | -.04 | **.17*** | -- | | | | | | | | |
| Pos2 | **.59**** | **.46**** | -.04 | **-.16*** | -- | | | | | | | |
| Inv2 | **.43**** | **.63**** | **-.20**** | **-.35**** | **.61**** | -- | | | | | | |
| Incon2 | -.03 | -.11 | **.65**** | .13 | -.14 | **-.19**** | -- | | | | | |
| Mon2 | -.11 | -.12 | **.25**** | **.43**** | **-.26**** | **-.27**** | **.30**** | -- | | | | |
| Pos3 | **.37**** | **.37**** | -.01 | **-.18*** | **.62**** | **.39**** | -.07 | -.06 | -- | | | |
| Inv3 | **.48**** | **.57**** | **-.24**** | **-.27**** | **.52**** | **.62**** | **-.24**** | **-.16*** | **.62**** | -- | | |
| Incon3 | -.14 | **-.20**** | **.53**** | .07 | -.10 | **-.18*** | **.57**** | .14 | -.13 | **-.26**** | -- | |
| Mon3 | **-.22**** | **-.20**** | **.24**** | **.38**** | **-.26**** | **-.26**** | **.27**** | **.50**** | **-.25**** | **-.34**** | **.37**** | -- |

*$p$<.01, **$p$<.001